In reply

Scientists in the wilderness

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"if human population grows unchecked and if the prevailing growth in consumption of resources remains the core of our socio-economic system, nature as we know it is doomed" (Allan Fox 2002).

On the 6th of January, 2002, I was standing outside the Fremantle Markets in Western Australia when a young lady, probably about a third my age, approached me with a flyer asking for support to protect Ningaloo Reef in the northwest from commercial development. As she explained it, the development in question proposed a tourist marina complex on a largely pristine beach which is an important nesting ground for marine turtles. The fact sheet she was distributing was cut out in the form of a sea turtle. The girl was a member of the Save Ningaloo Campaign (www.saveningalooreef.org) and what she was doing is a common activity among environmentalists throughout Australia. Without the dedication and enthusiasm of people like her, of all ages, developments, such as those proposed for Ningaloo, would proceed without question and with full government support. After all, that is what Australian governments are good at - making it easy for developers to exploit the nation's resources and in the process create material wealth and jobs.

I was already aware of the threats to the coral reefs of northwestern Western Australia. There are many others, including proposals for agricultural schemes to produce irrigated cotton and sugar cane which one can guarantee would have the same impacts on the coral reef ecosystems of the northwest that agriculture in northeastern Queensland has had on the Great Barrier Reef. But being confronted with a reminder of the constant threats from environmentally damaging and ecologically unsustainable development on an otherwise pleasant Sunday annoyed me. I was not annoyed at the young lady. Far from it, her dedication and concern was a poignant reminder that not all is hopeless. As Anne Reeves points out, we owe a great deal to 'underfunded' and mostly unpaid volunteers and environmental activists for the heightened level of environmental awareness we now see within Australian society.

I was annoyed because there is no environmental sense or justification in allowing any development near or within a coral reef environment with the potential to further threaten marine life. I was annoyed because I have seen these battles for environmental sanity rage, and mostly been lost, for my 60+ plus years of life. I was annoyed because young people still need to erect barricades and put their lives on hold in hope that government might show enough environmental concern for it to override economic and political imperatives. I was really annoyed because Western Australians had elected the Gallop Labor Government only a year ago in protest against a Coalition Government which had shown more than a little insensitivity to the concerns of Western Australians for their environment and nature. With a government elected by green votes, why does a young person need to hand out leaflets to strangers on a Sunday afternoon pleading for help to protect a part of our natural heritage of equal value to the Great Barrier Reef and meriting World Heritage status?

I really don't need to answer that question. The answer is in my paper to the NCC.

A reply in reply

I've begun this reply in reply with an anecdote of environmental activism to show the importance of the environmental movement and the hope it gives young and old. I also want to make it clear that I am fully aware of the role of the environmental movement and the breadth of issues that environmentalists address every day. I really do not need to be reminded of the scope of activities of the environmental movement. Just reading the annual report of the Total Environment Centre or the newsletters of any of the Nature Conservation Councils in Australia dispels any thought that the peak environmental groups in Australia aren't making a concerted effort on a wide range of issues from forests and threatened species to suburban nuclear reactors and public transport. I also applaud their growing involvement in land clearing issues, but like so many critical issues dealt with by environmentalists, it has come as a reaction to events, rather than one of anticipation or prediction.

All the activities undertaken by the environmental movement are important and necessary. I said as much in my paper, but I also said that the environmental movement needs to do more and to do it differently. As James Woodford (2001) said in his piece on Lomborg's book, and as Roger Lembit and Peter Myerscough acknowledge, environmentalists need to periodically review their priorities. The thrust of my paper was that more than review is needed. What environmentalists need to do is to anticipate issues instead of just reacting to symptoms of existing problems. In Dan Lunney's (2002) editorial to this issue, he calls for a vision of the future. What is the vision of the environmental movement in Australia? How far into the future are they looking?

Sometimes when I am approached by residents concerned about a development proposed for their backyard, I ask if they have ever questioned government policies which encourage larger populations, development and more jobs. No one has ever even answered, because very few people or organizations, whatever their credentials, question these goals and seem unable to see the relation with their problem. However, when populations grow and resources are developed, it must be in someone's backyard, so why not theirs? If they had a vision of the future, of the world they wanted for their great grandchildren's children, then they might have anticipated the threats and taken preemptive action to thwart their arrival. Of course, the underlying problem is that most of us want more of things: some want more money, some want more parks, but few of us recognize that the things we want more of already belong to other people and other species. An ethical society would not want more of things if that meant taking resources away from others or other species. Ethical conservation is about sharing with other species and with the future. It means placing need before want.

Unless the underlying forces of population growth and excessive resource and energy consumption are addressed urgently, handing out leaflets to protect reefs and forest old growth will amount to little more than fingers in a large leaky dike on the verge of a massive haemorrhage. We may feel good about what we are doing, but it will mean nothing in 50 years. As Allan Fox says, "... if human population grows unchecked and if the prevailing growth in consumption of resources remains the core of our socio-economic system, nature as we know it is doomed ...". John Dorman pointed out that the Australian Conservation Foundation (ACF) had been reluctant to tackle population issues from concern that it might be branded 'racist', an epitaph sometimes hung on persons and organizations who express concern about the size of Australia's population. An ethical environment movement has nothing to fear from such threats. Instead, it needs to be visionary and accept that the actions needed to achieve ecological sustainability will not be popular nor easy to achieve.

Most of the respondents to my paper accepted the need for review and consideration of underlying threats, but they were looking for more. David Paton said I failed to provide a "glimmer of hope" and had given "no answers or advice" on how to bring a humane decline in the population and restructure the agricultural system, while Peter Myerscough admitted that the tactics that might be followed in achieving my stated goals were not obvious. David proceeded with some good ideas on what might be done to achieve these goals.

Shelley Burgin and Nancy Pallin raised the issue of scientists failing to speak out and to be involved openly and publicly with environmental issues. Shelley thought I had condemned the environmental movement, while not being equally critical of my scientific peers. Several respondents raised the issue of communication. Nancy Pallin wanted advice on how to get a conservation message out to the public, while Keith Muir observed that 'complex environmental issues are not welcomed by the majority of the media'. John Dorman looked for ways of improving lines of communication between the environmental movement and the scientific community. Nadgee and the role of wilderness was a major part of the reply from Allan Fox, as of course was the reply from Lyn Evans and Tim Shepherd. Roger Lembit thought I had taken "cheap shots" and Keith Muir thought I had launched a 'frontal attack on national parks and wilderness'. Conversely, John Dorman agreed with me that too much emphasis had been placed by the environmental movement on wilderness.

The breadth of issues and comments raised in the replies is considerable and already justifies the suggestion from Dan Lunney that the *Australian Zoologist* be used as a forum to discuss, debate and extend the ideas I presented to the NCC. I have already commented on some points, but a few others merit special attention: forests as a conservation imperative, wilderness, dealing with population and resource consumption issues, management of the Nadgee Nature Reserve, the role of conservation reserves in research, and the failure of scientists to communicate and of the media to report environmental issues. If I omit something, it not necessarily because I think it is unimportant. It may already have been said, if not in my paper then in the replies from others. I will comment little on Dan Lunney's reply, which I mostly agree with, for the reason that what Dan has done is to extend the debate and others should take up the challenge.

Forests as a conservation imperative

Forests are important, I don't deny that and advocated the protection of forest old growth at a forestry forum in Brisbane almost 20 years ago (Recher 1985), a position I adhere to. Eucalypt forests by virtue of their incredibly high biodiversity (Majer *et al.* 1994, 2000a; Recher *et al.* 1996) and restriction to the Australian continent are one of the most important terrestrial ecosystems in the world. A mistake made by the environmental movement in New South Wales in the 1970s and early 80s was focusing too intently on temperate and cool temperate rainforests to the detriment of conserving the much richer eucalypt forests. This is analogous to the continuing emphasis on forests, albeit on eucalypt forests, to the detriment of the highly threatened woodlands and shrublands of the agricultural and pastoral zones. I agree with Roger Lembit that land clearing and degradation are high on the environmental agenda, but the media spotlight and public attention remains on the on-going forest disputes. My argument is that this diverts public attention from the more important land clearing and degradation issues and allows politicians to take the soft conservation options available in forest conservation. Thus, governments re-allocate land use within the Crown conservation estate, run up a long list of pocket sized reserves, and protect small areas of remnant old growth without putting procedures into place to allow old growth to develop elsewhere in the forest estate. They can do this to the applause of the environment movement (see the resolutions passed at the 2001 AGM of the NSW NCC) without needing to address the political and social challenges inherent in restructuring the agricultural system or in developing an ecologically based and environmentally sustainable population policy.

Even the ACF's policies on agricultural land do little more than pander to established rural interests, although I concede Peter Myerscough's point that 'bashing' farmers around with a 'big stick' will probably be counterproductive. However, with less than a third of farmers active in Landcare, changing the structure and management of agricultural systems for the betterment of conservation and sustainability is never going to be easy and I don't think it will be achieved without radical changes in policy and land ownership. David Paton's suggestion of buying out entire production units, but retaining the owners as paid managers merits discussion. I'd fund this system through an environmental levy on agricultural produce (Recher 1996), but I don't think either idea will be embraced without considerable leadership from a government committed to environmental sustainability and biodiversity conservation. Lunney's review of the Federal election in his editorial (Lunney 2002) shows how far Australia is in achieving environmental leadership from the political system.

Regional Forest Agreements

John Dorman says the conservation movement was forced into concentrating on forests by the government agenda on forest agreements, but I disagree with this. Instead, I say that the government was forced into setting up the Regional Forest Agreement (RFA) process by the success of the environmental movement in restricting logging activities and the Keating government's failure to pass legislation guaranteeing supply through the Senate. The RFA process was never intended to achieve anything more than guaranteeing supply to the wood products industry (Recher 1998a[1]). The RFA process and the science on which it was purportedly based were rejected by the National Biodiversity Council (NBC) in its submissions to government[2]. Similarly, the Royal Society of Western Australia (RSWA) was critical of the science on which WA's RFA was based and called for independent peer review.

I mention the role of both the NBC and RSWA because they are examples where there was strong, independent and public scientific input into an important conservation issue. But the outcomes of the RFA's were also adversely affected by pressure from the environmental lobby to protect old growth forest and wilderness. These pressures and the inevitable compromises between conservation and production, led to forests with high biodiversity values, but with a history of logging, from being excluded from the forest reserve system when they might have been best choice for biodiversity conservation (i.e., as in northeastern NSW). Unfortunately, the forest debate has seen many examples where the environmental movement failed to understand or rejected scientific advice. Do not take this as unbridled criticism of the environmental movement. The scientific community could also be criticized for failing to explain the issues well enough, but it has proven very difficult to gain acceptance for alternatives to reserves and wilderness as ways of meeting the objective of conserving forest biodiversity.

So, where does this leave the activists fighting for forests throughout eastern and southwestern Australia? I hope they continue to fight and to reject the RFA's in their respective states, as was comprehensively achieved in Western Australia. I also hope they will not let forest issues dominate the media. If the membership of the NPA (NSW) thinks forest conservation through a system of reserves and wilderness designations is their priority, as noted by Roger Lembit, then an education campaign about the threats to biodiversity in the rest of Australia is needed within the organization. Members of the NPA also need to be educated in what constitutes an ecologically viable reserve system and the time scale that such a system needs to be designed for. As starters, they could do worse than read *A Natural Legacy* (Recher *et al.* 1986), a book written specifically to inform a conservation minded audience about the science that needs to underpin all conservation initiatives.

Wilderness and parks

My comments on wilderness and national parks were provocative, but neither Roger Lembit nor Keith Muir appear to understand my comments. The long-term value to biodiversity conservation of Australia's conservation reserve system has been publicly and openly questioned by the scientific community since the 1970s, if not earlier (e.g., Recher 1971, 1976; Lunney and Recher 1986; Hall 1988; Lindenmayer and Recher 1998). Yet, few, if any, of these scientific concerns have found their way into the arguments of the environmental groups promoting the dedication of more reserves. It is therefore worth exploring some of the issues.

Most conservation scientists promote the protection of as large areas as possible. Large conservation reserves are important for several reasons, not the least being that they require less management intervention for their long-term viability. Large reserves may also be able to accommodate viable populations of some of the larger vertebrates, which small reserves cannot. Therefore, wilderness areas by virtue of their generally large size do have conservation value. There is no disagreement on this. However, I disagree with the contrasts Keith Muir draws between wilderness and disturbed environments and this is where emphasis on wilderness and the absence of disturbance can adversely affect the representativeness and biodiversity values of a reserve system.

The fact is that disturbed environments, regardless of what pest or exotic species they contain, often retain high levels of native biodiversity. To illustrate this point, Jonathan Majer and I have been sampling insects and spiders in eucalypt forests since 1986. As part of this work, we sampled the canopies of eucalypts at Karragullen in the hills immediately east of Perth and at Scheyville in Sydney's northwestern suburbs. Neither site is pristine. Karragullen has a 100+ year history of logging and fire disturbance and has lost significant components of its mammal and bird fauna. Scheyville has a 200+ year history of logging and grazing, and has lost many of its birds and virtually all of its native mammals. It has a high power transmission line running through its core, was used for military training and the ground vegetation is dominated by exotic weeds. Yet, from the four species of eucalypts we sampled, two at each location, we identified 500 more species of invertebrates (2200+) than there are terrestrial vertebrates on the entire Australian continent (Majer *et al.* 1994; Recher *et al.* 1996). Even a lone tree in a degraded paddock can be a vast reservoir of biodiversity (Recher and Majer 1996; Law *et al.* 2000; Majer and Recher 2000).

To answer Keith Muir's question, it is obvious that quite a lot, maybe most, of the faunal biodiversity of an area can survive high levels of prolonged disturbance. Karragullen is part of a State Forest and Scheyville is now a national park and justifiably so. However, 'saving' Scheyville from development was not easy and the task was made harder and took 25 years longer than it should have, because of the preoccupation of both the parks service and environmental groups with reserving more pristine areas remote from Sydney.

Those pristine areas are of conservation value, but so is Scheyville. Scheyville, by virtue of the threats of development[3], its proximity to Sydney, and the fact it was one of the few remnants of the original vegetation of the Cumberland Plain and had a unique biota, was probably of greater conservation priority than some more pristine areas which were already well represented in conservation reserves (the sandstone country around Sydney, for example) and under no special or immediate threat from development. There are many 'Scheyvilles' in Australia and my concern is that they are sacrificed in the scramble to protect 'wilderness'. In terms of being representative of the biota, they may be of greater conservation value than less disturbed sites or even of wilderness. Similar arguments can be used in assessing priorities for conserving individual species. Thus, one view is that biologically unique species, such as the Echidna *Tachyglossus aculeatus* , or species which are the sole representative of their genus or family, such as the Rock Warbler *Origma solitaria*, are more important to conserve than a species with many similar relatives, such as the Bush Rat *Rattus fuscipes*. Another view assigns priorities by threat, although not necessarily meaning that a species is currently endangered.

There are many examples of this among Australia's birds and in a piece being reviewed for publication in *Nature Australia*, Hugh Possingham questions the emphasis placed on saving species from extinction which are already endangered. He does not say that an endangered species has no value, no more than I have said wilderness has no value, but he does say that the emphasis on threatened species risks allowing non-threatened and common species becoming threatened. Instead, Possingham advocates a system of triage where the priority is placed on saving the biota, which, by virtue of its abundance if for no other reason, has the greatest chance of surviving provided its habitat and other requirements are conserved. He uses birds as an example and notes that, while considerable concern has been expressed for rare and endangered species, many birds considered common are in decline (Recher 1999[4]) and might be more easily saved, with less cost, than a few species on the brink of extinction. Possingham is not the first scientist to take this position (see, for example, McIntyre *et al.* 1992) and it is analogous to the concerns I expressed about undue emphasis on wilderness and even on large areas to the detriment of protecting more disturbed habitats and small remnants. The reversed argument between saving species and ecosystems, emphasizing those at least risk in one instance and those at greatest risk in the other, illustrates the importance of scale and the need to project trends in environmental degradation into the future (Recher 1999[4]).

In an ideal world, we would save both the wildernesses and the Scheyvilles, the rare and the common, the unique, as well as the mundane. But it is not an ideal world and, until the words of Allan Fox and James Woodford are taken seriously and the environment movement challenges the underlying social, population and economic threats to global biodiversity, conservation will always occur along the path of least political resistance and little of enduring value or importance will be protected in the long-term. Biodiversity conservation needs to be measured in millennia, not decades or even centuries, and the environment movement needs to better understand why this is the case and what needs to be done.

The position on wilderness that I put to the NCC was not that wilderness has no value, but that the emphasis on wilderness results in an unrepresentative and less viable reserve system. It also contributes little or anything to biodiversity conservation that could not be achieved by another form of conservation reservation, including remaining as State Forest. I said that I could not identify any plant or animal in Australia which required wilderness for its survival, although many require large areas and may be sensitive to too frequent disturbance, a statement which Keith Muir thinks is absurd. I therefore repeat myself. I know of no species which requires wilderness, nor can I name any Australian animal which will not cross a road, much less a bush track. I am happy to be corrected, but environmentalists need to be careful in making such statements that they actually have evidence in support.

Tracks, even quite narrow ones, do apparently impede movements of some animals in primary lowland rainforest in the Amazon, but that is not the situation in Australia and the reasons are easily explained by the historical differences in the two continent's ecology. Australia is a land of open habitats and highly fragmented landscapes. The Amazon is not and, while species may gain advantage by not crossing even narrow tracks in the Amazon, such behaviour would be evolutionary suicide in an Australian forest. Keith is correct when he says that bush tracks facilitate access by foxes and allow colonization by weeds, but so do walking tracks and I imagine he no more advocates walkers fanning out through the bush on their treks than he supports 4-wd enthusiasts driving side by side.

Wilderness is a recreation zoning in Australia and adds nothing to biodiversity conservation that could not be achieved with the same sized area protected as a national park or nature reserve (see Mackey *et al.* 1998 and Recher 1998b,c for a fuller discussion of the role of wilderness in nature conservation). What is important for nature conservation is the ecological integrity of an area and this is a function of size, spatial configuration, location relative to other reserves and the way in which surrounding lands are managed. Allan

Strom made the recreation role of wilderness eloquently clear when he wrote "....in a wilderness area, hardy recreation is a right" (Fox 2002).

The Nadgee Nature Reserve

Allan Fox and I agree on the importance of the Nadgee Nature Reserve as a research and scientific reference area. So, it appears, did Allan Strom when he focused on Nadgee to clarify the respective roles of wilderness areas (hardy recreation) and nature reserves (research and scientific reference). Wilderness areas and nature reserves both have high nature conservation values. However, effective, long-term management of nature requires a sound underpinning of science. Field studies of natural ecosystems and their component biota are remarkably recent in Australia, a legacy of stocking Australian tertiary institutions with Professors trained in Great Britain and with little or no experience in field based studies. It wasn't until the 1960s, when Australians, such as Jock Marshall, and young field ecologists, such as Jiro Kikkawa, were appointed, that Australian universities began to train students in wildlife ecology (Robin 2001). The 1960s also saw a flurry of activity in establishing long-term ecological studies to provide scientific reference areas against which change in natural ecosystems could be monitored in relation to fire, weather, logging, grazing and other disturbances.

CSIRO (Alan Newsome, Peter Catling), the NSW parks service (Allan Fox, Dan Lunney) and The Australian Museum (Harry Recher) among others selected Nadgee as a scientific reference area for long-term ecological studies in recognition of the total lack of such information for Australia. Their studies embraced plant (heath, dry sclerophyll forest) and animal communities (small ground-dwelling mammals, birds), populations (Ground Parrot *Pezoporus wallicus*, *Antechinus*, Swamp Rat *Rattus lutreolus*, Dingo *Canis sp.*), and natural processes (predation, fire, pollination) and have generated one of the most comprehensive sets of long-term ecological data available for any part of Australia. However, it is strange to call these studies long-term when the oldest has been running for less than 40 years and the systems under study are still changing in response to the 1972 wildfire which burnt the entire reserve (Recher *et al. in review*).

My comments about the merits of designating Nadgee as a wilderness are based on two issues. The first is that Australia and nature conservation lose a unique opportunity to continue the studies established in Nadgee during the 1960s and later. Allan Fox's comments show that the role of Nadgee as a scientific reference area was identified by the people instrumental in establishing the reserve originally. They also saw the potential for conflict between wilderness and scientific reference. Keith Muir's view that using radionucleotides to trace energy and nutrient flows in Nadgee's Little River was inappropriate highlights the lack of understanding and support of basic scientific research by some people in the environmental movement. The Little River study is precisely the kind of research scientific reference areas, such as Nadgee, are needed for.

Little River was selected because it was small and contained within a reserve where the research could proceed in the absence of other forms of human disturbance. Such studies in undisturbed environments provide the baseline data against which we can measure and evaluate human impacts in more disturbed environments. Together, studies in both pristine and disturbed environments enable us to develop the most effective management protocols to minimize the adverse effects of human activities and to restore function to dysfunctional ecosystems. Being critical of research without understanding either the reasons for the work or its role in environmental management is a too common failing among some in the environmental movement. I am happy to see critical reviews of scientific studies, but they should be based on knowledge and not on some myth or fear of the techniques and procedures used. The time to be critical is when the research is poorly done or its results are not applied, directly or indirectly, to conservation management; a problem that is not always the fault of the scientist.

Continuing the work

The studies at Nadgee have yet to provide the long-term data critically needed to assess the role of fire and other disturbances on heath and forest ecosystems. This is not because the research at Nadgee has failed to produce results or that the researchers have neglected to apply their findings to practical conservation management. It is because 30 or 40 years of continuous data recording is too short a time to fully encompass the scale of changes that occur within ecological communities during just the lifetimes of the researchers who initiate the studies. Continuing to monitor the long-term study plots at Nadgee is therefore important. There will be no other opportunities to obtain these data in Australia - anywhere - given current research funding and priorities.

As in 1994, 1983, 1980, 1977, and 1972 among other years, fires are raging across New South Wales as I write this. How do the proponents of wilderness propose to respond to the calls for more frequent burning (hazard reduction) in conservation reserves without anyone understanding the long-term effects of fire frequency, intensity and season of burning. Just opposing hazard reduction burning, as is common among environmental organizations, is not only an inadequate response, ecologically it may be the wrong response. Nadgee was a unique opportunity to obtain a critical component of the data needed to respond with facts, not emotion, but this opportunity is now all but lost. And here is a point of disagreement between what I have written and respondents, including Keith Muir and Lyn Evans and Tim Shepherd, who contend it is still possible to do research in the Nadgee Nature Reserve.

I agree that it is still possible to do research at Nadgee and, since the wilderness designation, Dan Lunney has managed to sample our small mammal plot on the Nadgee River annually (see Recher *et al. in review*). I was able to complete a census of birds on my Impressa Moor transects in November 2000 contributing to a data set which provides data on the recovery of heath birds 0, 1, 2, 3, 4, 9, 10, 11, 12, 16, 19, 20 and 28 years post-fire. Peter Catling has also been able to continue his studies monitoring populations of medium sized mammals, while surveys of owls and Eastern Bristlebird *Dasyornis brachypterus* have also been conducted. It is possible to do research, but at considerable additional costs and with added risks to the well-being and safety of the researchers that would not be tolerated in any other workplace.

Those who say it is possible to conduct research at Nadgee have a poor understanding of the requirements of ecological studies. Having driven from Western Australia, I arrived at Nadgee one day earlier than planned. Had I arrived on schedule I might not have been allowed to drive into the reserve due to wet conditions, which persisted for most of the first two weeks of November, and would therefore not have been able to spend a month carrying out the bird counts and making the vegetation measurements that extended the study from a 19 year study to a 28 year study and produced significant internal replication of results. This is a big difference in time during which the vegetation and the bird community changed significantly. There are three reasons why the data would not have been obtained had I not been able to drive into the reserve. First, and fairly basic, my assistant and I could not have backed packed our supplies and equipment for a month into Nadgee. Remember we are there to do research, not to have fun, and have a limited time to complete our work. Second, the project was set up in 1981 to monitor breeding bird populations on Impressa Moor with November to early December the months when breeding activity is greatest on the heaths and therefore the most appropriate time to conduct counts. Whatever else may happen, avian breeding seasons in eastern Australia differ very little between years (Marchant 1981, 1992; McLean *et al. in review*) and counts of breeding birds cannot be done at another time of the year simply because it suits the researchers or because the road is wet. Even a delay of a week or two can render the data meaningless. The counts had already been delayed a year due to a misadventure regarding research permits and, while another 12 month delay might not have mattered to the birds, it is not always possible to reschedule assistants and vehicles. Third, if I had not been able to drive into Nadgee after arriving from the west, the work could not have been done as the necessary research funds (in excess of $22 000 was spent) would no longer be available.

The issue for researchers is a simple one. Research projects are planned long in advance of their execution and the timing of the project is as critical as the location. Long-term monitoring studies such as those at Nadgee can neither be re-located nor can the time samples are taken be changed. Thus, when Nadgee was selected for the location of our research on birds and mammals, a primary consideration was reliability of access. Reliability of access is not only required for the timing of samples, but it is a necessary consideration for staff safety. Either or both of these considerations precludes postgraduate students from undertaking studies at Nadgee and building on the sets of data that have been obtained since the 1960s. My years as an active field ecologist are nearly at an end, but the projects I established at Nadgee remain. Conservation becomes the loser when these programs cannot be continued or re-visited by others in the future. I know of at least two long-term projects in former State Forests, which are now wilderness areas under management of the parks service, that have been affected in similar ways and face a similar fate. Both involve threatened fauna, as does the work on Impressa Moor.

It is too glib to say that research is permitted in Nadgee and other wilderness areas without considering both the requirements of field studies and the narrow criteria applied by the park service in deciding on the granting of a research permit. As Dan Lunney comprehensively addresses the last point, I won't discuss it here. It is sufficient to say that these criteria are at complete variance with the advice of Allan Strom reported in Fox's reply. Absolutely nothing of value to the conservation of biodiversity has been achieved by designating Nadgee as a wilderness and a great deal has been sacrificed. Despite the comments of Lyn Evans and Tim Shepherd, the additions to the reserve which Keith Muir and Lyn attribute to the wilderness designation would have proceeded in the fullness of time and had long been advocated by the scientists working in the southeast forests and Nadgee. True, we did not stop the upper Merrica Catchment from being logged or a logging road from being built to the headwaters of the Nadgee River, but neither did making it a wilderness, an event which took place after logging and road building.

Managing Nadgee

In my paper to the NCC, I described some of my concerns for the management of Nadgee now that it is a wilderness, but, as I have described these at length in my submission to the draft plan of management[5] and in my NCC paper, I will make only brief comments in reply to Lyn Evans and Tim Shepherd and the Service.

At no time have I said that there has been an increase in fire frequency as a result of the wilderness designation. What I have done is predict an increase as a result of uncontrolled access to and camping on the reserve's beaches from the sea. I am glad to see that the service has discussed the problem with user groups and I hope this will achieve the desired outcomes. I also need to disagree with the comments on control of vehicle access during wet conditions. Access along the Tumbledown Track has been restricted during wet conditions for as long as I can remember. The real problem of access to Nadgee for research arose when the all weather road was closed. To the best of my memory, this was not done in the interests of good environmental practice, but to save money. However, I believe this also predates the wilderness designation. I will also hold to the view that walkers should not be permitted on Nadgee's beaches during the breeding season of beach birds. Excluding people from nesting sites and potential nesting sites is necessary for the recovery beach nesting birds and should be a priority management goal in national parks and nature reserves throughout Australia even when the number of approved visitors is small, as at Nadgee. The problem is not 'squashing', as Keith Muir seems to think, but disturbance followed by predation of eggs and young by gulls and corvids. Persons concerned about nature conservation should be the first to hold their hands out to help these birds which have no other options of where to feed and nest.

Scientists, the media and communication

Several respondents mentioned the role of scientists and the media in communicating environmental information to the public and to environmental groups. Although I have noted an increase in the number of conservation scientists prepared to comment publicly and to use the media for communication, a problem remains with getting the scientific community fully involved in public commentary. This is particularly so for sensitive issues, such as logging, land clearing and population policy. However, I have written at length on this subject, including the role of the media, (see, for example, Recher 1992, 1994, 1998d) and am happy to make these papers available on request. There is also an excellent conference publication from the Ecological Society of Australia concerning the subject of scientific communication (Wills and Hobbs 1998). There is nothing I could add here on why scientists are reluctant to participate publicly that has not already been said in those papers. As for improving channels of communication between environmental organizations and the scientific community, I have a few suggestions:

Environmental organizations should consider using independent scientists to review organizational statements and submissions for their scientific content and accuracy. This is the same review or refereeing procedure used within the scientific community with respect to grant applications, submissions, reports and scientific papers.

More advantage should be taken by environmentalists of public scientific meetings and workshops, such as those of the Royal Zoological Society (NSW) and the Royal Society of Western Australia as a way of learning more about science and scientists, and networking.

Arrange joint workshops to explore conservation and environmental issues of mutual interest.

Shelley Burgin comments that some scientists wear both a 'conservation' and a 'science' hat, but I wonder how many conservationists can say the same. Perhaps, more conservationists need to become scientists, just as I'd like to see more of my colleagues in science become active conservationists.

Dealing with population and resource consumption issues

How do I address David Paton's request for good advice on a humane reduction in the population? I start by saying there needs to be public and open discussion of a population policy for Australia and the kind of nation we are building. Do we just want more of everything, as seems to be the policy underlying all government decisions on development and resource consumption or is there a better future based less on material consumption and monetary wealth and more on personal and cultural development? If the latter, then we need to do more as a nation to encourage education and individual development, and less to encourage mass entertainment and professional sports. How are these things done? We start by putting them in the public domain and this is where the environment groups have a central role.

Individuals can join Sustainable Population Australia (www.population.org.au) and give it the weight of numbers needed to bring population issues to the forefront of public discussion. Organizations need to inform themselves of how population growth and resource consumption, when projected over time, will affect their long-term conservation goals.

Read Allan Fox's words carefully. When informed, they should develop their own position on population policy and make it known.

In my NCC paper, I said the environmental movement needed to assess its priorities and to focus more on the underlying threats to biodiversity conservation and less on the symptoms. James Woodford (2001) said the same thing with a slightly diffferent emphasis on issues. Obviously, there are sympathetic listeners in the media. If all they hear is 'end logging', 'stop mining' and 'more parks', then that is all they can report. From personal experience, I know just how difficult it is to get the mainstream media to carry alternative ideas to the standard 'more of everything'. However, if population policy or restructuring agriculture become dominant themes for discussion among environmental organizations, the media will find it hard to avoid reporting and the sympathetic listeners in the media will find it easier to report.

A final word

Perhaps the most humane way of tackling Australia's population problem (see Recher and Lavery 1999) and that of the world is to share more of our material and intellectual wealth with others. Educating people and empowering them with opportunity, especially women, is possibly the most humane and effective way of improving standards of living and health while reducing birth rates. Exporting knowledge and training people how to help themselves is far better than fending them from our shores with gun boats and imprisoning those who refuse to turn around.

An ethical nation would act very differently both towards other people and other species. Australia's treatment of refugees shows just how great the challenges are for both nature conservation and our human spirit.

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(Those references in the text with a (2002) date, but which do not appear below, are authors of responses to Recher in the preceding part of this section Opinion Piece – ed.)

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Footnotes

[1] Available on request from the author.

[2] The National Biodiversity Council was established in 1994 and comprised a group of conservation biologists elected by their peers. It ceased to function a few years ago, but copies of its submissions on the RFA are available from H. Recher who acted as Chair during the late 1990s.

[3] Interim Conservation Orders were twice required to stop development - once from becoming a hazardous waste site and once from being released for housing. Both ICOs were initiated by scientists working within government and not by environmental groups, none of which seemed much interested in Scheyville at the time. It was also necessary for these scientists to intervene with the parks service to prevent Scheyville from being reserved as a park with all cleared areas excised for housing and the park boundary drawn around the perimeter of the remnant woodland. It now remains to be seen if the park service can manage Scheyville to both protect and restore its biodiversity values, a process which may require, at least temporarily, returning cattle to the park to control weed growth and fuel loads.

[4] An updated manuscript is available from the author.

[5] Copies of my submission to the draft plan of management for Nadgee will be made available on request.